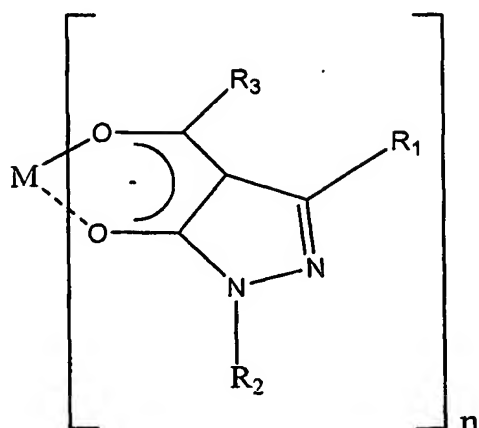


- 25 -

## Claims

1. An electroluminescent compound which has the formula



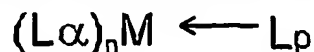
(I)

where M is a metal other than aluminium; n is the valency of M; R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> which may be the same or different are selected from hydrogen, hydrocarbyl groups, substituted and unsubstituted aliphatic groups substituted and unsubstituted aromatic, heterocyclic and polycyclic ring structures, fluorocarbons such as trifluoryl methyl groups, halogens such as fluorine or thiophenyl groups or nitrile; R<sub>1</sub> and R<sub>3</sub> can also be form ring structures and R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> can be copolymerisable with a monomer, e.g. styrene.

2. A compound as claimed in claim 1 in which M is gallium, indium, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV) and metals of the first, second and third groups of transition metals in different valence states, e.g. manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium. titanium, vanadium, zirconium, tantulum, molybdenum, rhodium, iridium, titanium, niobium, scandium or yttrium.

- 26 -

3. An electroluminescent compound which has the formula



where  $L\alpha$  is of formula (II) herein, M is a metal, n is the valency of M and  $L_p$  is a neutral ligand.

4. An electroluminescent compound as claimed in claim 3 in which the groups  $L_p$  are selected from compounds of formula (III), (IV), (V), (VI), (VII), (VIII), (IX) and (X) herein and figs. 11 to 15 of the drawings.

5. An electroluminescent compound as claimed in claim 3 in which M is a metal selected from gallium, indium, aluminium, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV) and metals of the first, second and third groups of transition metals in different valence states e.g. manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, titanium, niobium, scandium or yttrium.

6. An electroluminescent device comprising (i) a first electrode, (ii) an electroluminescent layer comprising a layer of an electroluminescent compound as claimed in claim 1 or 2 and (iii) a second electrode.

7. An electroluminescent device as claimed in claim 6 in which M is gallium, indium, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV) and metals of the first, second and third groups of transition metals in different valence states, e.g. manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, titanium, niobium, scandium, or yttrium and  $R_3$  is a phenyl or substituted phenyl group.

- 27 -

8. An electroluminescent device comprising (i) a first electrode, (ii) an electroluminescent layer comprising a layer of an electroluminescent compound as claimed in any one of claims 3 to 5 and (iii) a second electrode.
- 5 9. A device as claimed in any one of claims 6 to 8 in which there is a layer of a hole transmitting material between the first electrode and the layer of the electroluminescent complex.
- 10 10. A device as claimed in any one of claims 6 to 9 in which there is a layer of an electron transmitting material between the second electrode and the layer of the electroluminescent complex.
- 15 11. An electroluminescent device which comprises (i) a first electrode, (ii) a layer of a hole transmitting material, (iii) an electroluminescent layer comprising an electroluminescent compound as claimed in any one of claims 1 to 5, (iv) a layer of an electron transmitting material and (v) a second electrode.
- 20 12. An electroluminescent device as claimed in claim 11 in which the hole transmitting layer is an aromatic amine complex.
- 25 13. An electroluminescent device as claimed in claim 9 in which the hole transmitting layer is formed from a poly(vinylcarbazole), N,N'-diphenyl-N,N'-bis (3-methylphenyl) -1,1' -biphenyl -4,4'-diamine (TPD), polyaniline, or a substituted polyaniline.
14. An electroluminescent device as claimed in claim 9 in which the hole transmitting layer has a formula (XI) or (XII) herein or as in figs. 1 to 4 of the drawings.

- 28 -

15. An electroluminescent device as claimed in claim 9 in which the hole transmitting layer is a conjugated polymer as herein specified.

5 16. An electroluminescent device as claimed in claim 9 in which the hole transmitting layer is selected from poly (p-phenylenevinylene)-PPV and copolymers including PPV, poly(2,5 dialkoxyphenylene vinylene), poly (2-methoxy-5-(2-methoxypentyloxy-1,4-phenylene vinylene), poly(2-methoxypentyloxy)-1,4-phenylenevinylene), poly(2-methoxy-5-(2-dodecyloxy-1,4-phenylenevinylene) and other poly(2,5 dialkoxyphenylenevinylenes) with at least one of the alkoxy groups  
10 being a long chain solubilising alkoxy group, poly fluorenes and oligofluorenes, polyphenylenes and oligophenylenes, polyanthracenes and oligo anthracenes, ploythiophenes and oligothiophenes.

15 17. An electroluminescent device as claimed in any one of claims 9 to 16 in which the hole transmitting material and the light emitting metal compound are mixed to form one layer in a proportion of 5 to 95% of the hole transmitting material to 95 to 5% of the light emitting metal compound.

20 18. An electroluminescent device as claimed in any one of claims 10 to 17 in which the electron transmitting material is a metal quinolate or as in fig. 5 of the drawings.

19. An electroluminescent device as claimed in claim 18 in which the metal quinolate is lithium, sodium, potassium, zinc, magnesium or aluminium quinolate.

25 20. An electroluminescent device as claimed in any one of claims 10 to 19 in which the electron transmitting material and the light emitting metal compound are mixed to form one layer in a proportion of 5 to 95% of the electron transmitting material to 95 to 5% of the light emitting metal compound.

30 21. An electroluminescent device as claimed in any one of claims 6 to 20 in which

- 29 -

the anode and/or cathode is formed on a substrate of crystalline silicon and the surface of the substrate may be polished or smoothed to produce a flat surface prior to the deposition of electrode, or electroluminescent compound.

- 5      22. An electroluminescent device as claimed in any one of claims 6 to 21 in which the anode and/or cathode is formed on a substrate of a non-planarised silicon substrate.
- 10      23. An electroluminescent device as claimed in any one of claims 6 to 22 in which there is a copper phthalocyanine layer on the first electrode and a lithium fluoride layer on the second electrode.